



# Second Five-Year Review Report

---

For the East Helena Superfund Site

**East Helena, Lewis and Clark County,  
Montana**

Prepared by

**HDR ONE COMPANY | *Many Solutions***  
1715 South Reserve Street | Missoula, MT | 59801

Prepared for

U.S. Environmental Protection Agency  
Region 8

Helena, Montana

**March 31, 2006**

Approved by:

Date:

---

John F. Wardell  
Director, Montana Office  
U.S. E.P.A. Region 8

## Contents

<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>FIVE-YEAR REVIEW SUMMARY FORM .....</b>	<b>3</b>
<b>FIVE YEAR REVIEW REPORT.....</b>	<b>7</b>
<b>I. Introduction.....</b>	<b>7</b>
Purpose of the Review .....	7
Authority for Conducting the Five-Year Review .....	8
Who Conducted the Five-Year Review .....	8
Other Review Characteristics .....	8
<b>II. Site Chronology.....</b>	<b>9</b>
<b>III. Background .....</b>	<b>10</b>
Location and Setting .....	13
Site History and Extent of Contamination .....	14
<b>IV. Response Actions .....</b>	<b>17</b>
OU1 Process Ponds.....	17
<b>V. Progress since the Last Review .....</b>	<b>22</b>
<b>VI. Five-Year Review Process .....</b>	<b>23</b>
Administrative Components .....	23
Community Involvement .....	23
Document Review .....	24
Data Review.....	24
Site Inspection .....	24
<b>VII. Technical Assessment .....</b>	<b>25</b>
<b>Question A: Is the remedy functioning as intended by the decision documents? .....</b>	<b>25</b>
<b>Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid? .....</b>	<b>26</b>
<b>Question C: Has other information come to light that could call into question the protectiveness of the remedy? .....</b>	<b>28</b>
<b>VIII. Issues .....</b>	<b>29</b>
<b>IX. Recommendations and Follow-up Actions .....</b>	<b>29</b>
<b>X. Protectiveness Statement(s) .....</b>	<b>30</b>
<b>XI. Next Review .....</b>	<b>30</b>

## Tables

Table II-1. Site Chronology .....	9
Table III-1 Toxicity Values (1989 ROD) .....	16
Table III-2. Exposure Point Concentrations in Lower Lake .....	17
Table IV-1. Lower Lake Remedial Actions.....	18
Table IV-3. Speiss Granulating Pond and Pit Remedial Actions .....	20
Table IV-4. Acid Plant Water Treatment Facility Remedial Actions.....	21
Table IV-5. Former Thornock Lake Remedial Actions.....	21
Table VII-1. Prescribed Standards and Recent Water Quality Samples.....	25
Table VII-2. ARAR Comparison for 1989 ROD Prescribed Standards .....	27

## Figures

Figure III-1 General Superfund Site Location in Lewis and Clark County, Montana .....	11
Figure III-2. Site Location .....	12

## Appendices

Appendix A: Summary of Operable Units not Covered by the 1989 Record of Decision	
Appendix B: Documents and Data Reviewed	
Appendix C: Correspondence	

## List of Acronyms

µg/L	micrograms per liter
µg/m <sup>3</sup>	micrograms per cubic meter
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
Asarco	American Smelting and Refining Company
BAMP	Best Agricultural Management Practice
CAMU	Corrective Action Management Unit
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
HDS	High Density Sludge
MCL	Maximum Contaminant Level
MDEQ	Montana Department of Environmental Quality
mg/L	milligrams per liter
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
POTW	publicly owned treatment works
PRP	potentially responsible party
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Site	East Helena Smelter site
TDS	Total Dissolved Solids
WQD	Water Quality Division

## Executive Summary

The U.S. Environmental Protection Agency (EPA) Region 8 conducted the second five-year review of the remedial actions implemented at the East Helena Superfund Site near East Helena, Montana. The purpose of the five-year review is to determine whether the Site remedy is protective of human health and the environment. Because hazardous substances, pollutants or contaminants remain at the Superfund Site above levels that allow for unrestricted use and unlimited exposure, and because it has been more than five years since the first five-year review, this second five-year review is required by statute<sup>1</sup>.

The Superfund Site is located in East Helena, Montana and includes a 110-year-old smelter facility, residential and commercial areas, and surrounding rural agricultural and undeveloped lands. In 1987, the Superfund Site was separated into five operable units (OU's) including;

**OU1 - Process Ponds:** including Lower Lake, the Speiss Granulating Pond and Pit, the Acid Plant Water Treatment facility, former Thornock Lake, and the process fluids circuitry.

**OU2 - Groundwater:** including shallow groundwater under the plant, and a plume of contaminated groundwater that extended beyond the boundaries of the smelter site and into the shallow aquifer underlying a portion of East Helena.

**OU 3 - Surface Soils, Surface Water, Vegetation, Livestock, Fish and Wildlife, and Air:** including plant site soils, residential East Helena soils, other Helena Valley soils, Prickly Pear Creek, and Wilson Irrigation Ditch.

**OU4 - Slag Pile:** including the approximately 35-acre slag pile and any contaminated soil under the slag pile.

**OU 5 - Ore Storage Areas:** including air, groundwater and surface water.

In 1989, a Record of Decision (ROD) was issued to address OU1. No decision documents<sup>2</sup> have been issued for the other four OU's.

EPA divided responsibilities for the OU's between Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) authorities. In general, CERCLA has been the governing agency for the surface soils, vegetation, livestock, and fish and wildlife, and RCRA has been the governing agency for all other aspects of the site. RCRA will continue to be the governing authority for these other OU's (although the RCRA

---

<sup>1</sup> A statutory review is required when a.) upon completion of the remedial action, hazardous substances, pollutants, or contaminants will remain on site and b.) the ROD for the site was signed on or after October 17, 1986 (the effective date of SARA2) and the remedial action was selected under CERCLA §12

<sup>2</sup> Decision Document: A document prepared at the conclusion of a remedial investigation, feasibility study, environmental analysis, or remedial alternatives analysis to formalize the selection of an alternative.

program does not use the 'Operable Unit' designation) and other corrective actions related to the former plant site.

The first five-year review (1999) was triggered by the Remedial Action Start Date of July 1, 1992 and it discussed all five OU's; however, for management purposes OU3, OU4 and OU5 were grouped together (EPA, 1999). This second five-year review specifically addresses OU1, and its associated remedial actions<sup>3</sup>. Because a decision document has not been produced for the other 4 OU's, the general extent of contamination and remedial actions taken to date will be summarized only (see Appendix A, Summary of Operable Units not Covered by the 1989 Record of Decision).

---

<sup>3</sup> According to EPA Comprehensive Five-Year Review Guidance, Section 1.5.2 states "When a RCRA action is included as a part of a CERLCA action, the RCRA action should be included in the five-year review as a matter of policy, if a five-year review is required or appropriate."

## Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: East Helena Superfund Site		
EPA ID: MTD006230346		
Region: 8	State: MT	City/County: East Helena/Lewis and Clark
SITE STATUS		
NPL status: Listed 1984		
Remediation status: Operating		
Multiple OUs: Yes	Construction completion date: Construction Incomplete	
Has site been put into reuse? No		
REVIEW STATUS		
Lead agency: EPA		
Author name: Scott Brown		
Author title: Project Manager	Author affiliation: U.S.EPA, Region 8	
Review period: October 2005 through February 2006		
Date(s) of site inspection: November 29, 2005		
Type of review: Statutory		
Review number: 2 (second)		
Triggering action: First Five-Year Review		
Triggering action date: September 1999		
Due date: 2004 (1 <sup>st</sup> Five-Year Review was completed in 1999)		

\* ["OU" refers to operable unit.]

### Five-Year Review Summary Form, cont'd.

**Issues:**

Item No.	Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1	The prescribed standards for surface water in Lower Lake have not been met.	Y	Y
2	As prescribed by a 1993 ESD, the drying area between Upper and Lower Lakes has not yet been completely or adequately remediated.	Y	Y
3	A 1993 ESD stated that, "monitoring wells shall be installed downgradient from Lower lake and between Lower Lake and Prickly Pear Creek prior to remediation of Lower Lake, but not later than July 1, 1993, to monitor for compliance with performance standards." Under the RCRA , some wells have been installed. However, no performance standards have been set for groundwater.	Y	Y
6			
7			
8			
9			
10			



## Five-Year Review Summary Form, cont'd.

### Recommendations and Follow-up Actions:

These issues should be identical to those on the previous page.

Item No	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
1	The prescribed standards for surface water in Lower Lake have not been met.	Lower Lake water should be treated in the HDS facility until it reaches prescribed standards, as recommended by a 1993 ESD. If this approach is deemed invalid, an evaluation should be conducted to determine the most appropriate treatment method.	Asarco	2006
2	As prescribed by the ESD, the drying area between Upper and Lower Lakes has not yet been completely or adequately remediated.	The area between Upper and Lower Lake should be remediated. The ESD states, "the sediments under the pad (in the contaminated area between Upper and Lower Lakes) shall be excavated and smelted after all Lower Lake sludges and sediments are excavated, dried, and removed from this area." However, because the plant is closed and smelting is no longer an option, the contaminated material should be disposed of under RCRA regulations.	Asarco	2007
3	A 1993 ESD stated that, "monitoring wells shall be installed downgradient from Lower lake and between Lower Lake and Prickly Pear Creek prior to remediation of Lower Lake, but not later than July 1, 1993, to monitor for compliance with performance standards." Under the RCRA, some wells have been installed. However, no performance standards have been set for groundwater.	Additional groundwater monitoring wells may be necessary as prescribed by the ESD. Performance standards should be developed for groundwater related to OU1.	Asarco	2006

---

## **Five-Year Review Summary Form, cont'd.**

### **Protectiveness Statement(s):**

The remedy as implemented is not yet fully protective of human health and the environment. Lower Lake contaminants exceed the standards prescribed by the ROD for two of five parameters, and Lower Lake is hydrologically connected to Prickly Pear Creek, a water of the U.S.

### **Other Comments:**

The prescribed standards for water quality stated in the 1989 Record of Decision were revised downward from the Applicable or Relevant and Appropriate Regulations (ARARs) based on achievability due to background conditions, technical impracticability, and cost. Since 1989, the ARARs for some of the chemicals of concern have decreased. As noted in this review and further emphasized by the State of Montana Department of Environmental Quality, the federal MCL for Arsenic has recently been decreased to 10 ug/L and this 'calls into question the protectiveness of the 20 ug/L prescribed standard' with regard to Lower Lake, which is hydrologically connected to Prickly Pear Creek.

However, the ROD prescribed standards remain consistent with the remedial action objectives. The adequacy of the established remedial action objectives, under Superfund actions, is now superseded by the RCRA Facility Investigations. Lower Lake and Prickly Pear Creek are regulated by the RCRA Facility Investigations, and under RCRA, Lower Lake's connection to Prickly Pear Creek and technical practicability's are currently under investigation; therefore, no changes are recommended to the prescribed standards at this time.

# Five Year Review Report

## I. Introduction

### Purpose of the Review

This is the second statutory<sup>4</sup> Five-Year Review (Review) for the East Helena Superfund Site, National Priorities List (NPL) CERCLA ID MTD006230346. The purpose of this Review is to evaluate the implementation and performance of remedies at the NPL Site to determine whether the remedies are protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, five-year review reports identify issues found during the review, if any, and recommendations to address them.

In 1987, prior to the 1989 Record of Decision, the NPL Site was separated into five operable units (OU's) including;

**OU1 - Process Ponds:** including Lower Lake, the Speiss Granulating Pond and Pit, the Acid Plant Water Treatment Facility, former Thornock Lake, and the process fluids circuitry.

**OU2 - Groundwater:** including shallow groundwater under the plant, and a plume of contaminated groundwater that extended beyond the boundaries of the smelter site and into the shallow aquifer underlying a portion of East Helena.

**OU3 - Surface Soils, Surface Water, Vegetation, Livestock, Fish and Wildlife, and Air:** including plant site soils, residential East Helena soils, other Helena Valley soils, Prickly Pear Creek, and Wilson Irrigation Ditch

**OU4 - Slag Pile<sup>5</sup>:** including the approximately 35-acre slag pile and any contaminated soil under the slag pile.

**OU5 - Ore Storage Areas:** including air, groundwater and surface water.

The first Five-Year review was triggered by the Remedial Action Start Date of July 1, 1992, and it discussed all five OU's; however, for management purposes OU3, OU4 and OU5 were grouped together (EPA, 1999). In accordance with Five-Year Review guidance, this second five-year review will address OU1 only, and its associated remedial actions<sup>6</sup>. Because a decision document has not

---

4 A statutory review is required when a.) upon completion of the remedial action, hazardous substances, pollutants, or contaminants will remain on site and b.) the ROD for the site was signed on or after October 17, 1986 (the effective date of SARA2) and the remedial action was selected under CERCLA §12

5 The 1999 Five Year Review stated that the slag pile was 57-acres; however, personal communication between MDEQ and Asarco determined that the slag pile is currently about 35-acres.

6 EPA Comprehensive Five-Year Review Guidance, Section 1.5.2 states, "When a RCRA action is included as a part of a CERCLA action, the RCRA action should be included in the five-year review as a matter of policy, if a five-year review is required or appropriate."

been produced for the other 4 OU's, the general extent of contamination and the remedial actions taken to date will be summarized only (see Appendix A, Summary of Operable Units not Covered by the 1989 Record of Decision).

### **Authority for Conducting the Five-Year Review**

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f) (4) (ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This second Five-Year Review was conducted in accordance with the Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P entitled Comprehensive Five Year Review Guidance (EPA, 2001), and OSWER Directive 9355.7-12 regarding supplemental guidance for evaluating institutional controls.

### **Who Conducted the Five-Year Review**

The EPA Region 8 conducted the second five-year review of remedial actions prescribed by the 1989 ROD for OU1, implemented at the East Helena Superfund Site near East Helena, Montana. In October 2005, HDR Engineering, Inc. of Missoula, Montana was retained by EPA Region 8 to provide technical support during completion of the second five-year review, which was released in February 2006. HDR was retained under a General Services Administration contract.

### **Other Review Characteristics**

In 1987, the Superfund Site was separated into five operable units (OU's) including; OU1 - Process Ponds, OU2 – Groundwater, OU3 - Surface Soils, Surface Water, Vegetation, Livestock, Fish and Wildlife, and Air, OU4 - Slag Pile, and OU5 - Ore Storage Areas.

Subsequently, EPA Region 8 changed the Operable Unit designations for the East Helena Superfund Site. Currently, EPA recognizes two Operable Units associated with the Superfund Site; these include OU1 – Process Ponds, and OU2 - Surface Soils, Vegetation, Livestock, and Fish and Wildlife.

EPA divided responsibilities for the OU's between Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) authorities. In general, CERCLA has been the governing agency for the re-defined OU2 (surface soils, vegetation, livestock, and fish and wildlife), and RCRA has been the governing agency for all other aspects of the site. RCRA will continue to be the governing authority for these other OU's (although the RCRA program does not use the 'Operable Unit' designation) and other corrective actions related to the former plant site. CERCLA will continue to be the governing authority for the re-defined OU2 including the on-going cleanup of residential and agricultural soils.

## II. Site Chronology

**Table II-1. Site Chronology**

<b>Event</b>	<b>Date</b>
Lead smelter operations begin	1888
Environmental investigations begin	1969
First blood-lead study conducted by Montana Department of Health and Environmental Sciences (MDHES) and the National Centers for Disease Control	1975
Preliminary Assessment	01/01/1981
Site Inspection and HRS <sup>1</sup> Package	06/01/1983
EPA's Superfund National Priorities Listing (NPL) <sup>2</sup>	09/21/1984
Remedial Investigation/Feasibility Study complete	06/23/1987
Asarco notified MDEQ of its status as a Large Generator of hazardous waste	12/12/1988
Record of Decision, East Helena Smelter Site, Process Ponds Operable Unit (OU1)	11/1989
Remedial Design (RD) for OU1 (start date)	9/11/1990
Remedial Action (RA) for OU1 (start date)	3/31/1992
Consent Decree between EPA and Asarco and Anaconda Minerals Co.3 regarding the removal of hazardous substances and reporting requirements for OU1.	12/27/1990
Explanation of Significant Differences, Process Ponds (OU1)	6/17/1993
OU1 construction dates (start, finish)	07/22/1991 to Present
Consent Decree between Asarco and U.S. EPA regarding violations of the Clean Water Act (among other regulations), and the storage of hazardous materials in violation of RCRA.	May 5, 1998
First Five-Year Review (OU1)	9/27/1999
East Helena Asarco Incorporated Smelter placed in "indefinite closed status"	04/04/2001

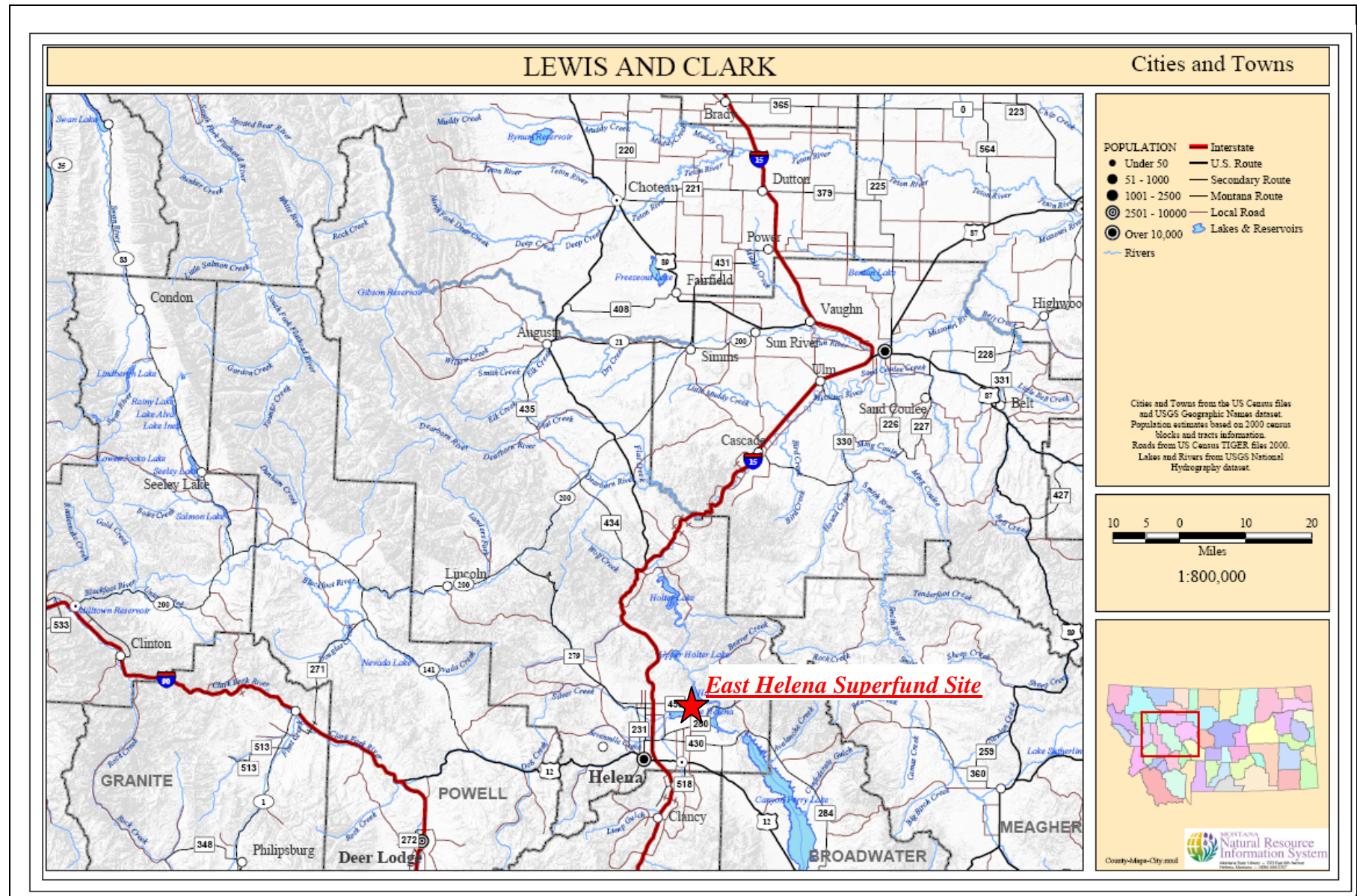
Event	Date
Consent Decree between Asarco and MDEQ regarding violations of on-site hazardous waste accumulation, including non-permitted discharge from the wastewater system to Lower Lake and from Lower Lake to Prickly Pear Creek.	2/17/2005
Construction completion date for OU1	Not Completed
Final Closeout Report for OU1.	Not Completed
Deletion from NPL	Not Completed
<p>1 HRS: Hazard Ranking System</p> <p>2 EPA National Priorities List is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.</p> <p>3 Anaconda Minerals Co. constructed and operated a zinc fuming plant at the site from 1927 to 1972. It was purchased by Asarco in 1972.</p>	

### III. Background

The East Helena Superfund Site includes portions of the community of East Helena, Lewis and Clark County, and Jefferson County, Montana (see Figure III-1, General Superfund Site Location in Lewis and Clark and Jefferson Counties, Montana). The ‘Superfund Site’ includes a lead smelter operating from 1888 until 2001, the town of East Helena, several residential subdivisions, small commercial businesses, and surrounding rural agricultural and undeveloped lands. The ‘Smelter Site’ is about a 160-acre facility including numerous process buildings, administrative buildings, materials holding areas, storage tanks, and other facilities. The Process Ponds (OU1) is part of the ‘Smelter Site’, and will be referred to hereafter as ‘the Site’. Figure III-2, Smelter Site provides an overview of the smelter site. The plant had been active until Asarco Incorporated shut it down on April 4, 2001. Asarco has characterized the shut down as “indefinite closed status”, but it is most likely permanent.



Figure III-1 General Superfund Site Location in Lewis and Clark and Jefferson Counties, Montana



**Figure III-2. Site Location**



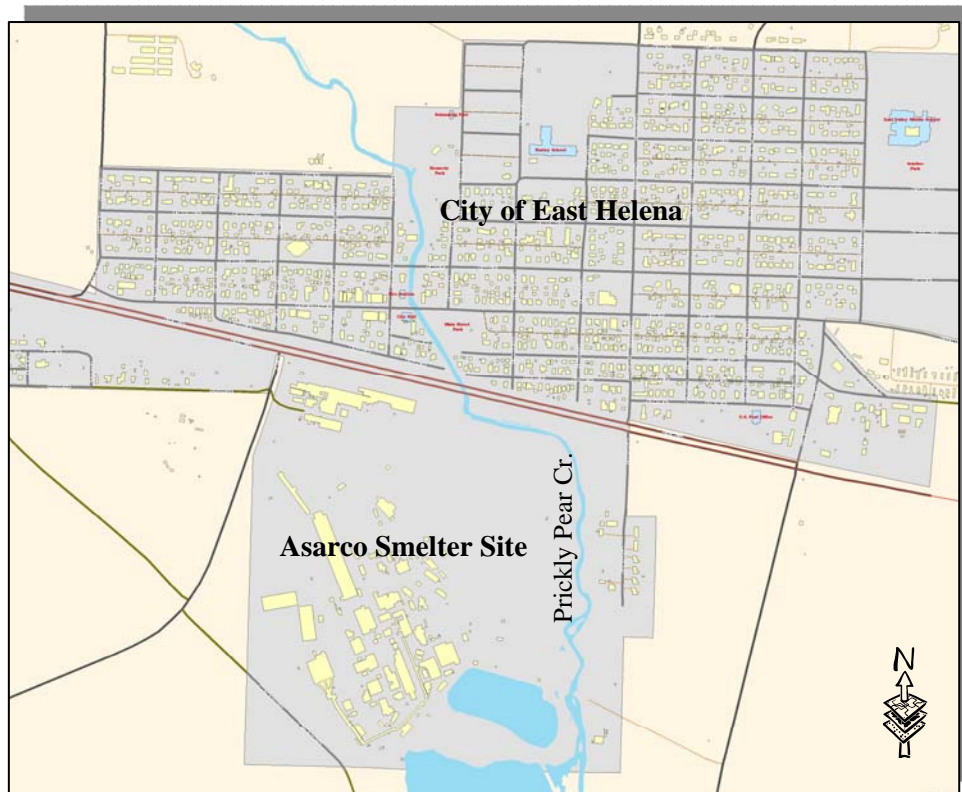
## Location and Setting

The Smelter Site is bounded by East Highway 12 to the North, Highway 282 to the West, and Prickly Pear Creek to the East (see Figure III-2 Site Location). This is the location of a primary lead smelter that operated for more than 110 years, and also recovered zinc and other metals during much of its existence.

According to the 2000 census, the community of East Helena has a population of 1,642 people. Approximately 3 miles to the west is the City of Helena, with a population of approximately 26,000 people. Residential areas of East Helena are within 1/4 mile of the main smelter area, separated from the site by both U.S. Highway 12 and a rail line.

## Physical Characteristics

The Smelter Site includes Prickly Pear Creek and it is underlain by unconsolidated alluvium deposited by the ancestral Prickly Pear Creek. The alluvial deposits have variable permeability and consist of layers and mixtures of cobbles, gravel, sand, silt, and clay. Underlying the alluvium west and north of the Site are fine-grained, Tertiary, volcanic-ash tuff deposits with low permeability, having weathered to a fine-grained clay in some locations. Surface water and groundwater in the area flow from south to north, exiting in the northeastern corner of the Helena Valley into Lake Helena (located approximately 10 miles north of the town of East Helena). The smelter site and the City of East Helena are shown in Figure III-3 Smelter Site and East Helena.



**Figure III-3 Smelter Site and East Helena**

## Land and Resource Use

The current land uses of the entire Superfund Site include established residential areas and small commercial business, newer residential subdivisions, agricultural and undeveloped lands, and the Asarco Incorporated smelter facility. Land use on the Smelter Site includes buildings, storage areas, a CAMU, several large storage tanks, and soil storage areas. Public access on the site is restricted.

## Site History and Extent of Contamination

Asarco Incorporated purchased the 160-acre plant from the Helena and Livingston Lead Smelting Company in 1899. During the early to mid 1970s, the State of Montana's Air Quality and Water Quality Bureaus, exercising authorities arising from the National Clean Air and Clean Water Acts, began conducting investigations of smelter emissions and surface water discharges at East Helena smelter facility. Overwhelming evidence of environmental impacts was readily observable in the form of large areas of barren soils, reduced agricultural production, reduced abundance and diversity of aquatic invertebrates in Prickly Pear Creek, and verified reports of livestock deaths.

Early measurements of air quality and soil metal levels confirmed the long-held suspicion that lead, cadmium and other contaminants were accumulating in the soils and were also present at high levels in street and household dust throughout the community.

Several sources of contamination have been identified at the East Helena Smelter Site:

- Smelter stack emissions
- Fugitive emissions from plant processes such as the blast furnace, dross plant, and sinter plant
- Ore storage area, particularly prior to 1990
- Slag pile (characterize as a minor source)
- Process ponds and process fluids circuitry
- Direct discharges to Prickly Pear Creek and East Helena Publicly Owned Treatment Works (POTW)

The lead and zinc smelting operations deposited lead, arsenic, copper, zinc, cadmium, and some 15 other hazardous substances into the surrounding area. These sources have impacted the air, soils, surface water, groundwater, vegetation, livestock, wildlife, and human receptors. The 1989 Record of Decision identified the process ponds as the first operable unit for remedial action because existing data indicated that the process ponds and fluids were the most significant and well-characterized sources affecting the groundwater, both on and off the plant site.

The two primary modes of contaminant deposition in the East Helena soils are aerial and surface water deposition. It was also determined that unpaved streets and alleys, and non-vegetated fields are sources of contaminated, wind-blown dust. The predominant wind direction in East Helena is toward the northeast. This has resulted in the highest concentration of airborne metals deposition in the East Fields area and in the eastern portions of East Helena. Other areas surrounding the smelter are also

contaminated with metals from airborne particulates, albeit at lesser concentrations. Metals are also deposited in the overflow areas of the irrigation/drainage ditches as well as the flood plain areas along Prickly Pear Creek. Prickly Pear Creek flows along the east and north boundaries of the smelter plant and drains into Lake Helena approximately 10 miles to the north. Elevated lead levels have been found in surface soils collected from residential areas in East Helena as well as the undeveloped areas in and around the town. See Appendix A for more detailed discussion regarding OU2, OU3, OU4, and OU5.

### ***Site Health Risks.***

Several reports have been prepared describing public health and environmental risks at the Superfund Site. These include the following;

- *CH2MHill (1987) – Remedial Investigation (RI) of Soils, Vegetation, and Livestock*
- *Hunter/ESE (1989) – Comprehensive Endangerment Assessment (CEA)*
- *USFWS (1997) – Biological Indices of Lead Exposure in Relation to Heavy Metal Residues in Sediment and Biota from Prickly Pear Creek and Lake Helena, Montana*
- *USGS (1998) – Field Screening of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Helena Valley, West-Central Montana, 1995*
- *EPA (2005) – Supplemental Ecological Risk Assessment, East Helena, Montana. With assistance from Syracuse Research Corp.*
- *Kleinfelder and Hydrometrics, Inc. (1995) – Human Health Risk Assessment for Residential Soil, East Helena Plant, East Helena, Montana.*
- *ISSI (1999) – Risk Assessment Review Memorandum*

The 1989 Comprehensive Endangerment Assessment and the 2005 Supplemental Ecological Risk Assessment will be briefly discussed below.

The 1989 Comprehensive Endangerment Assessment (Hunter/ESE, 1989) was prepared in support of the feasibility study for OU1, and is summarized in the 1989 Record of Decision. Twenty-seven chemicals were analyzed in the Process Ponds media of concern<sup>7</sup>. Indicator contaminants were selected based on their potential risk to public health and the environment; arsenic, cadmium, and lead were selected because of their potential to cause adverse human health effects, and copper and zinc were selected due to their potential impacts to aquatic biota. It should be noted that although only five indicator chemicals were selected, there were 18 total hazardous elements at elevated

---

<sup>7</sup> Media of concern is defined in the Record of Decision as sediments in Lower Lake and former Thornock Lake, contaminated soils at the Acid Plant Water Treatment Facility and the Speiss Granulating Pond and Pit, process water in all areas except former Thornock Lake, surface water in Prickly Pear Creek, and groundwater below the site and East Helena.

concentrations in the surface water, groundwater, soils, and sediments at the site at the time of the 1989 Endangerment Assessment. The Endangerment Assessment also included Cancer Potency Factors and Reference Doses for these contaminants of concern as shown in Table III-1. Contaminant intakes and resulting risks were not quantified in the Endangerment Assessment, and the results were not used to set prescribed standards for OU1.

**Table III-1 Toxicity Values (1989 ROD)**

Parameter	Toxicity Values for Non-Carcinogenic Effects				Toxicity Values for Carcinogenic Effects			
	Oral Route		Inhalation Route		Oral Route		Inhalation Route	
	AIC <sup>a</sup>	RFD <sup>d</sup>	AIC	RFD	Potency Factor	Weight of Evidence rating	Potency Factor	Weight of Evidence rating
	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	(mg/kg/day) <sup>-1</sup>		(mg/kg/day) <sup>-1</sup>	
Arsenic					1.5	A	50	A
Cadmium		5E-4					6.1	B1
Copper	3.7E-2 <sup>b</sup>		1.0E-2					
Lead	1.4E-3 <sup>c</sup>		4.3E-4			B2		B2
Zinc	2.1E-1		1E-2					
<p>a AIC: Acceptable Intake for Chronic Exposure</p> <p>b Excess cancer risks are determined by multiplying the intake level with the cancer potency factor. For example, an excess cancer risk of 0.000001 indicates that an individual has a one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.</p> <p>c This value has been withdrawn by EPA</p> <p>d Reference Doses (RFD) are estimates of lifetime daily exposure levels for humans, including sensitive individuals.</p>								

The 1989 Endangerment Assessment found arsenic concentrations greater than 20 times the federal drinking water standard (maximum contaminant level) of 50 parts per billion (at the time of the study) in shallow groundwater aquifers. These affected aquifers are not a source of drinking water in East Helena; however, the potential for human health risk exists if the arsenic migrates into deeper aquifers. See Appendix A for information about groundwater contamination.

The 2005 Supplemental Ecological Risk Assessment was produced to address exposure areas, receptors and pathways that were not evaluated as part of the original 1989 Comprehensive Endangerment Assessment produced to address the Process Ponds (OU1). Therefore, this 2005 Ecological Risk Assessment primarily addresses exposures unrelated to OU1; however, as part of the risk assessment study, samples were taken in areas such as Lower Lake, which are directly applicable to OU1 (see Table III-2). Sample locations include; Lower Lake, the marshy area between Lower Lake and Prickly Pear Creek, Prickly Pear Creek, Lake Helena, and Canyon Ferry. For Lower Lake,

Hazard Quotient<sup>8</sup> values indicate that surface water in the lake may be acutely toxic to the aquatic community due to elevated concentrations of several metals including cadmium, antimony, thallium, and selenium. Surface water Hazard Quotient values for Lower Lake are higher than the other on-site lake (Upper Lake) and the off-site reference (Canyon Ferry Reservoir). Surface water concentrations of several metals are above levels associated with acute and chronic toxicity for several fish and benthic invertebrate species. This study did not conduct a risk assessment for human receptors.

**Table III-2. Exposure Point Concentrations<sup>1</sup> in Lower Lake**

Analyte	Surface Water (mg/L)
Arsenic	0.24
Cadmium	0.0089
Copper	0.032
Lead	0.087
Zinc	0.12

Source: 2005 Ecological Risk Assessment, EPA. Table 6-2, Exposure Point Concentrations Used to Evaluate Potential Risks to Wildlife.

<sup>1</sup> Wildlife receptors are likely to move at random across an exposure area. Therefore, exposure is best characterized as the mean concentration across the entire area. Because only a limited number of samples are available to represent the exposure area, there is uncertainty associated with this calculated mean concentration. To account for this uncertainty, the USEPA recommends using an exposure point concentration (EPC) to represent the typical exposures at a location. The EPC is either the 95% Upper Confidence Level (95UCL) on the mean concentration or the maximum concentration, whichever is lower. For datasets with a limited number of samples, the 95UCL on the mean is often higher than the maximum. At this site, the number of samples from each exposure area for this site was relatively small. Therefore, wildlife exposures were simply based on the maximum detected concentrations (EPA 2005).

## IV. Response Actions

### OU1 Process Ponds

In 1989, a Record of Decision (ROD) was released for the selected remedial action for OU1. OU1 includes Lower Lake, former Thornock Lake, the Speiss Granulating Pond and Pit, and the Acid Plant Water Treatment Facility. Arsenic is the primary contaminant of concern for this OU because of its mobility relative to the heavy metals, and because it is a human toxin. The overall intended purpose of the OU remedial action is to eliminate future contact between process waters and the underlying soils and groundwater.

In 1993, EPA released an Explanation of Significant Differences (ESD) that modified some of the remedial action required in the 1989 ROD. If applicable, these are described in Table IV-1.

The remedial actions to be taken for each subunit of OU1 are described below.

---

<sup>8</sup> A Hazard Quotient (HQ) is the ratio of the estimated exposure of a receptor at the site to a "benchmark" exposure that is believed to be without significant risk of unacceptable adverse effect:  
 $HQ = \text{Exposure} / \text{Benchmark}$

**Lower Lake.**

Lower Lake collected and stored water used in the main plant process circuits and runoff from the plant site. The pond is about 7 acres in surface area and has a capacity of about 11 million gallons. Lower Lake is hydrologically connected to Prickly Pear Creek, a water of the U.S. The remedial actions required by the ROD, any prescribed standards, changes to the remedial actions, and actions taken to date are presented in Table VI.-1.

**Table IV-1. Lower Lake Remedial Actions**

Action	Prescribed Standards <sup>1</sup>	Deviations	Actions Taken To Date	Prescribed Standards or General Requirements <sup>3</sup> Met
Replace Lower Lake with two large steel tanks as the plants primary holding facility for process waters.  Tanks would be 1 million gallons each and accumulated sediments would be periodically suctioned out and reprocessed.	None	No	2-1 million gallon storage tanks were constructed in 1989.	Yes
Treat Lower Lake water in place by co-precipitation of metals and arsenic	Arsenic 0.02 mg/L Cadmium 0.01 mg/L Lead 0.05 mg/L Copper 0.004 to 0.008 mg/L Zinc 0.11 mg/L	Yes	Lower Lake water was not treated in-situ. A High Density Sludge (HDS) Water Treatment Plant was constructed on the Site in 1994. <sup>9</sup> After construction, upgrading was needed to improve the effluent water quality; these were completed in May 1997. The plant meets MPDES effluent requirements that are different from the ROD requirements for treatment of Lower Lake.  Water was treated in the High Density Sludge treatment facility. The extent and results of this treatment are unknown.	No.  Surface water exposure point concentrations for Lower Lake reported by EPA <sup>5</sup> in 2005 were as follows;  Arsenic 0.24 mg/L Cadmium 0.0089 mg/L Copper 0.032 mg/L Zinc 0.12 mg/L
Construct lined, contained drying pads for saturated sediments	None	Yes	This area was found to be contaminated, and the 1993 ESD proposed remediation as follows, "the sediments under the pad (in the contaminated area between Upper and Lower Lake) shall be excavated and smelted after all Lower Lake sludges and sediments are excavated, dried, and removed from this area."  This remediation has not been completed.	No.  The 1993 ESD significantly changed this remedy.

<sup>9</sup> The High Density Sludge facility is regulated under an MPDES waste water discharge permit (permit number MT0030147)

Action	Prescribed Standards <sup>1</sup>	Deviations	Actions Taken To Date	Prescribed Standards or General Requirements <sup>3</sup> Met
<p>Excavate the most highly contaminated sediments and treat by smelting onsite.</p> <p>Remove 2 ft. of sludge and 2 additional feet of sediments.</p> <p>After drying, sediments would be stored in the ore storage building.</p> <p>Smelting would likely occur over a 12-15 year period.</p>	None	Yes	<p>The 1993 ESD modified this remedy as follows;</p> <p><i>"...at least six inches of the sediment layer will be excavated. ...but is no longer required to attain the 2 ft. depth called for in the ROD."</i></p> <p><i>"...monitoring wells shall be installed downgradient from Lower Lake, but not later than July 1, 1993, to monitor for compliance with performance standards."</i></p> <p>Actions taken to date include;</p> <ul style="list-style-type: none"> <li>• Sediments were dredged and dried in filter presses in August 1996.</li> <li>• Smelting was initiated in 1994, but discontinued. Between 1994 and 1997, about 4,280 cubic yards were smelted of the approximately 27,000 cubic yards.</li> <li>• These remaining sediments were stockpiled and covered with a geomembrane layer. In 2002, they were placed in a CAMU<sup>2</sup>.</li> </ul>	Yes
<p>Construct lined pond for emergency containment of storm runoff.</p> <p>The pond should be designed to contain runoff from the 100-year, 24-hour storm event (assuming 95% paved conditions at the plant).</p>	None	No	<p>The stormwater collection tank constructed was completed in December 1997.</p>	Yes. Stormwater is permitted through the NPDES program. <sup>4</sup>
<p>1 The Applicable or Relevant and Appropriate Requirements (ARARs) were considered unattainable due to technical impracticability; therefore, Prescribed Standards were used to measure the effectiveness of the remedy. Prescribed Standards are defined in the ROD as attainable standards.</p> <p>2 The Corrective Action Management Unit (CAMU) was constructed for the deposition of accumulated sediments and soils from implementation of OU1 remedial actions and other excavations. It holds about 75,000 cubic yards.</p> <p>3 The General Requirement of the OU1 remedial action is to eliminate future contact between process waters and the underlying soils and groundwater.</p> <p>4 Asarco has an Industrial Stormwater Permit, Permit No. MTR000072 that expires on September 30, 2006. According to MDEQ, Asarco's permit is in compliance. (HDR 2005a). Since 1997, stormwater has been regulated through the State of Montana MPDES permit program, for Industrial Stormwater Discharge. No further stormwater actions are required under the ROD.</p> <p>5 Supplemental Ecological Risk Assessment for the East Helena Smelter Site, Montana. January 25, 2005, Prepared by U.S. EPA with Syracuse Research Corp, Table 6-2. Exposure Point Concentrations Used to Evaluate Potential Risks to Wildlife EPCs Based on Maximum Detected Concentrations.</p>				



***Speiss Granulating Pond and Pit.*** The Speiss Granulating Pond provided storage for water used to cool the hot speiss from the dross plant.

**Table IV-3. Speiss Granulating Pond and Pit Remedial Actions**

Action required by ROD	Prescribed Standards <sup>1</sup>	Deviations	Actions Taken To Date <sup>2</sup>	Prescribed Standards or General Requirements <sup>3</sup> Met
Replace existing pond with steel tank with liner, leak detection system, and secondary containment and recovery capability.	None	No	Containment facility constructed in 1995.	Yes
Replace existing speiss granulating pit with a leak proof concrete pit with a liner, leak detection system, and secondary containment and recovery capability.	None	No	Speiss granulating pit demolition was completed in August 1995. At that time, Asarco changed the granulating operation from water to air granulation; therefore, there was no further need for the concrete pit. The air granulating method was used until the plant was closed in 2001.	Yes
Excavate contaminated soils and treat by smelting onsite.	Depth approx. 6 ft. to 20 ft.	No	Soils were excavated to the maximum depth practicable without compromising the integrity of adjacent structures. This excavation was completed in 1995.	Yes
<p>1 The Applicable or Relevant and Appropriate Requirements (ARARs) were considered unattainable due to technical impracticability; therefore, Prescribed Standards were used to measure the effectiveness of the remedy. Prescribed Standards are defined in the ROD as attainable standards.</p> <p>2 1999 Five Year Review states that, "ASARCO completed all work associated with the Speiss Granulating Pond and Pit in 1995."</p> <p>3 The General Requirement of the OU1 remedial action is to eliminate future contact between process waters and the underlying soils and groundwater.</p>				

***Acid Plant Water Treatment Facility.***

Investigations conducted in the early 1970's revealed that sulfur dioxide levels exceeded ambient air quality standards. In response to this, Asarco constructed the Acid Plant Water Treatment Facility between 1974 and 1977.



**Table IV-4. Acid Plant Water Treatment Facility Remedial Actions**

Action required by ROD	Prescribed Standards <sup>1</sup>	Deviations	Actions Taken To Date	Standards or General Requirements <sup>3</sup> Met
Remove existing settling dumpsters and pond.	None	No	Demolition completed in 1993.	Yes
Excavate contaminated soils and return metals to the process by which they were generated by smelting onsite.	None	Unknown	Completed in 1993 <sup>2</sup>	Yes
Replace existing settling dumpsters and pond with closed circuit filtration treatment system.	None	No	Construction completed in 1992.	Yes
<p>1 The Applicable or Relevant and Appropriate Requirements (ARARs) were considered unattainable due to technical impracticability; therefore, Prescribed Standards were used to measure the effectiveness of the remedy. Prescribed Standards are defined in the ROD as attainable standards.</p> <p>2 1999 Five Year Review states that, "ASARCO completed all work associated with the acid plant water treatment facility in 1993.</p> <p>3 The General Requirement of the OU1 remedial action is to eliminate future contact between process waters and the underlying soils and groundwater.</p>				

In the late 1970's, Asarco constructed 3 million gallon sulfuric acid storage tanks. In response to MDEQ requirements, the acid storage tanks were mostly drained in 2001 leaving a small reservoir of 1,250 gallons in each tank to provide acid vapor pressure. Asarco plans to ensure the integrity of the storage tanks by routinely analyzing the sulfuric acid strength (sulfuric acid is more corrosive at lower concentrations) and conducting ultrasonic metal thickness testing on the storage tank exterior walls. The remedial actions required by the ROD were completed, and this ongoing maintenance will be addressed under RCRA.

#### ***Former Thornock Lake.***

Former Thornock Lake was part of the main plant process water circuit and was used primarily for preliminary settling of suspended solids. In 1986, Thornock Lake was replaced with a steel holding tank, complete with a liner, leak detection system, and secondary containment and recovery capability. This former lake no longer contains process fluids and only bottom sediments remain.

**Table IV-5. Former Thornock Lake Remedial Actions**

Action required by ROD	Prescribed Standards <sup>1</sup>	Deviations	Actions Taken To Date	Standards or General Requirements Met
Excavate sediments and treat by smelting onsite.	The depth of sediment removal will be 2 feet beyond the lower limit of the artificially deposited sediment layer.	No	Completed in 1991 <sup>2</sup>	Yes

Action required by ROD	Prescribed Standards <sup>1</sup>	Deviations	Actions Taken To Date	Standards or General Requirements Met
<p>1 The Applicable or Relevant and Appropriate Requirements (ARARs) were considered unattainable due to technical impracticability; therefore, Prescribed Standards were used to measure the effectiveness of the remedy. Prescribed Standards are defined in the ROD as attainable standards.</p> <p>2 The 1999 Five Year Review states, "ASARCO completed all work associated with former Thornock Lake in 1991."</p> <p>3 The General Requirement of the OU1 remedial action is to eliminate future contact between process waters and the underlying soils and groundwater.</p>				

## V. Progress since the Last Review

The first Five-Year Review offers the following statement of protectiveness with regard to OU1, *"The remedial actions carried out for the process ponds and process fluids circuitry address all immediate threats, but the remedy is not yet fully protective. More work may be needed in this area to ensure long-term protection of groundwater and surface water. As part of the RCRA corrective action measures that EPA is requiring at the Site, ASARCO is conducting additional monitoring in the process ponds and fluids circuitry area and reevaluating whether additional action may be necessary to address contamination."*

The 1999 Five Year Review also recommended that an Explanation of Significant Differences (ESD) to the 1989 Record of Decision be prepared for OU1. In general, the ESD would address the following;

- Treatment of Lower Lake Water by the High Density Sludge (HDS) facility.
- Management of Stormwater Runoff: ASARCO demonstrated that the flow of stormwater from the plant would not reach Lower Lake; however, stormwater could reach Prickly Pear Creek. In 1997, ASARCO completed a stormwater system improvement project pursuant to its stormwater permit. EPA recommended eliminating all stormwater management requirements identified in the Process Ponds ROD.
- Disposition of Lower Lake Sediments: Sediments excavated from Lower Lake were stockpiled onsite until Asarco constructed an onsite landfill or Corrective Action Management Unit (CAMU) in 2002 for permanent disposition of the sediments.
- Disposition of Soils and Sediments Located between Upper Lake and Lower Lake: A 1993 ESD identified the acid plant sediment drying pad and underlying soils, located between Upper and Lower Lakes, as a source of arsenic for Lower Lake. Consequently, the ESD called for the removal of contaminated sediments in this area as follows, "the sediments under the pad (in the contaminated area between Upper and Lower Lake) shall be excavated and smelted after all Lower Lake sludges and sediments are excavated, dried, and removed from this area." According to the 1999 Five-Year Review, after collecting soil samples in 1996, Asarco, EPA, and the State decided that arsenic and metals leachate concentrations were sufficiently low to defer excavation of soils. However, recent water and sediment sampling from Lower Lake indicate an increase in metals and arsenic and warrants further examination.

EPA determined that the transfer of some responsibilities to RCRA negated the need for this ESD, and it was never completed.

Additional events occurring since the last Five-Year Review include the following;

- The operations at the Asarco East Helena Plant were suspended in April 2001.
- Construction of the CAMU was completed in 2002; dried sediments dredged from Lower Lake are stored in the CAMU.

Other clean up actions have taken place, both on and off the plant site, since the 1999 Five-Year Review including residential soils remediation. These actions are discussed in more detail in Appendix A. It should also be noted that Asarco filed for protection under Chapter 11 of the United States Bankruptcy Code on August 9, 2005. The future implications of this are not known at this time; however, currently Asarco continues to work on remedial actions at the Site.

## **VI. Five-Year Review Process**

### **Administrative Components**

This is the second five-year review for the Site. The five-year review was led by Scott Brown, EPA CERLCA Project Manager for the Site. The following team members participated in the review:

- Scott Brown, EPA Remedial Project Manager
- Steven Moores, EPA Enforcement Attorney
- Iver Johnson, MDEQ
- Linda Jacobson, EPA
- Daryl Reed, MDEQ

EPA Contractors:

- Shanna Adams, HDR Engineering, Inc.
- Ken Napp, HDR Engineering, Inc.

This five-year review consisted of the following activities: a review of relevant documents; meetings with EPA and MDEQ, risk assessment review; data review; and a site visit. The schedule for the review extended through January 2006.

### **Community Involvement**

Community involvement has been ongoing for more than a decade with regular public meetings including an Annual Public Meeting (conducted annually for at least the last 5 years), EPA presentations at East Helena City Council meetings (about 5-6 times per year), and monthly meetings

of the East Helena Lead Advisory Council. Notice was given regarding the second five-year review at each of these meetings as follows;

- Annual Public Meeting: announcement made on October 25, 2005.
- East Helena City Council meeting: announcement made on October 18, 2005.
- East Helena Lead Advisory Council<sup>10</sup>: several announcements made between 2003 and 2005.

According to EPA and MDEQ, public interest and feedback has been primarily focused on groundwater pollution and residential soil contamination and remediation. There were no comments noted specifically related to the Process Ponds.

In April 2006, a notice will be placed in a local newspaper announcing that the second five-year review has been completed and that copies of the report are available for the public to review at the:

U.S. EPA Region 8 Records Center  
10 West 15<sup>th</sup> Street, Suite 3200 Helena MT 59626  
(406) 457-5000

Montana Department of Environmental Quality  
1100 N. Last Chance Gulch, PO Box 200901, Helena, MT 59620  
(406) 841-5041

Lewis and Clark County Lead Education and Abatement Program Office  
2 South Morton  
East Helena, MT 59635  
(406) 227-8451

## Document Review

See Appendix B for a complete list of documents and data reviewed.

## Data Review

See Appendix B for a complete list of documents and data reviewed.

## Site Inspection

The HDR project manager, Shanna Adams, and MDEQ Environmental Science Specialist Iver Johnson, visited the Site on November 29, 2005.

---

10 The East Helena Lead Advisory Council includes members from EPA, MDEQ, Lewis and Clark Lead Education and Abatement Program, the City of East Helena, and the public.

## VII. Technical Assessment

This technical assessment includes information directly related to OU1. Information about other areas of the site can be found in Appendix A.

### Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is largely functioning as intended by the decision documents. There are two primary areas that are not yet functioning as intended; these are described below.

**1.) Lower Lake.** The prescribed standards for surface water in Lower Lake have not yet been met. The remedy in the ROD included treatment of Lower Lake water in place by co-precipitation of metals and arsenic. The 1993 ESD changed the order of activities to co-precipitate *after* sediments removal. Co-precipitation was abandoned, and a High Density Sludge (HDS) treatment facility constructed in 1994. The HDS facility was primarily constructed for treating acid plant water, but Asarco also proposed using the HDS facility to treat Lower Lake surface water<sup>11</sup>.

The ROD included prescribed standards for surface water in Lower Lake; these are presented in Table VII-1.

**Table VII-1. Prescribed Standards and Recent Water Quality Samples**

1989 ROD Prescribed Standards	2005 Lower Lake Water Quality Samples <sup>1</sup>
Arsenic 0.02 mg/L	Arsenic 0.2 to 0.216 mg/L
Cadmium 0.01 mg/L	Cadmium 0.0066 to 0.0069 mg/L
Lead 0.05 mg/L	Lead 0.0175 to 0.0236 mg/L
Copper 0.004 to 0.008 mg/L	Copper 0.0202 to 0.0213 mg/L
Zinc 0.11 mg/L	Zinc 0.07 to 0.103 mg/L
<sup>1</sup> Source: Supplemental Risk Assessment for the East Helena Smelter Site, January 2005. Prepared by EPA. Appendix A, Table 1b Measured Total Surface Water Concentrations in Samples Collected During the 2003 Field Investigation. Note: A range of values is given in this table because three sample values are provided in the Table 1b.	

**2.) Sediments between Upper and Lower Lake.** The remedy selected in the 1989 ROD included the following, “construct a lined, contained drying pads for saturated sediments.” This area was found to be contaminated, and the 1993 ESD proposed remediation as follows, “the sediments under the pad (in the contaminated area between Upper and Lower Lake) shall be excavated and smelted after all

<sup>11</sup> The 1998 Complaint and Consent Decree states that ‘From October, 1994 to present (1998), Asarco discharged process wastewater containing pollutants from its High Density Sludge Treatment Facility to Lower Lake. None of these discharges to Lower Lake were authorized by a permit issued pursuant to the National Pollutant Discharge Elimination System.’ Therefore, the extent and results from any treatment of Lower Lake water in the HDS facility is unknown.

Lower Lake sludges and sediments are excavated, dried, and removed from this area.” This remediation has not been completed.

### **Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?**

At this time, the remedial action objectives are considered valid and there are no revisions recommended to the 1989 ROD prescribed standards. The prescribed standards in the 1989 ROD were based on a combination of ARARs and technical practicability. The prescribed standards for Arsenic, Cadmium and Lead were revised from the ARARs due to technical impracticability, while the prescribed standards for Copper are more stringent than required by the ARARs, and the prescribed standards for Zinc are the same as the ARARs. The bases for the chosen prescribed standards are as follows;

- Arsenic was set at 0.02 mg/L because it was the upper range of water quality data measured from Prickly Pear Creek, and it was below the federal primacy MCL of 0.05 mg/L
- Cadmium was set at 0.01 mg/L because this was the federal primacy MCL, and was believed to be achievable.
- Lead was set at 0.05 mg/L because it was the next promulgated standard above the state water quality standard, and was believed to be achievable.
- Copper prescribed standards in the ROD are more stringent (0.004 to 0.008 mg/L) than the 1989 ARAR standard of 0.012 mg/L because Copper levels in Prickly Pear Creek, both above and below the smelter, are in the range of 0.004 to 0.008 mg/L.
- Zinc prescribed standards were the same as the applicable EPA federal and state ARARs; however, it should be noted that Zinc levels in Prickly Pear Creek upstream of the smelter site occasionally exceeds this level of 0.11 mg/L.

To determine if any changes should be made to these prescribed standards, they were compared to *similar* current standards in Table VII-2. For example, Arsenic values were compared to Current National Recommended Water Quality Criteria for *acute* Criterion Maximum Concentration (CMC), and all other elements were compared to *chronic* Criterion Continuous Concentration (CCC) because that was the methodology presented in the 1989 ROD.

Table VII-2 shows that all standards applicable in 1989 have since been revised downward by either federal or state standards, except for Arsenic<sup>12</sup>. The most recent known water quality samples taken in Lower Lake are presented in the Supplemental Ecological Risk Assessment (EPA, 2005), and shown

---

<sup>12</sup> The value of 2.2 nanograms per liter is not explicitly cited in the 1989 ROD, and both state and federal regulations are currently significantly higher than this standard.

in Table VII-2. It should be noted that the water hardness associated with each prescribed standard in the 1989 ROD is unknown. Current National Water Quality Criteria are given for a hardness of 100 mg/L, and the data presented in the Supplemental Ecological Risk Assessment shows that hardness values for Lower Lake are between 190 and 207 mg/L. Table VII-2 includes values adjusted to the hardness found in Lower Lake (190 to 207 mg/L hardness).

These data show significant decreases in contaminant levels from samples previously taken in 1984-1987 for Arsenic, Cadmium, and Lead. In addition, the 1989 ROD prescribed standards for surface water in Lower Lake for Cadmium, Lead, and Zinc have been met, according to this water quality data. Copper and Arsenic levels remain above the 1989 ROD prescribed standards, but Arsenic levels are below the current federal and state ARARs for acute aquatic life. In addition to acute aquatic life standards, the 1989 ROD noted that the prescribed standards were below the federal MCL of 50 ug/L. This federal MCL has recently been revised to 10 ug/L; because of this, the State of Montana Department of Environmental Quality notes that this “calls into question the protectiveness of the 20 ug/L standard” (see Appendix C – Correspondence). At this time, because the prescribed standards remain consistent with the overarching remedial action objective of ‘eliminating the primary source of groundwater contamination’, and in light of ongoing RCRA Facility Investigations, no change to the prescribed standards is recommended at this time.

**Table VII-2. ARAR Comparison for 1989 ROD Prescribed Standards**

Parameter	1989 Standards <sup>1</sup>	1989 ROD Prescribed Standards for Lower Lake	Lower Lake <sup>2</sup> (1984 – 1987)	2005 EPA National Standards (Adjusted for Hardness in Lower Lake)	2005 State Standards <sup>5</sup>	Lower Lake (2005) <sup>6</sup>
Arsenic	0.0022 ug/L	20 ug/L	19,900 ug/L	340 ug/L <sup>4</sup> (not hardness dependent)	340 ug/L	200 to 216 ug/L
Cadmium	1.1 ug/L	10 ug/L	1050 ug/L	0.25 ug/L (0.38 to 0.41 ug/L)	0.16 ug/L	6.6 to 6.9 ug/L
Lead	3.2 ug/L	50 ug/L	5110 ug/L	2.5 ug/L (5 to 6 ug/L)	3.2 ug/L	17.5 to 23.6 ug/L
Copper	12 ug/L	8 ug/L	Not Provided	9 ug/L (15 to 17 ug/L)	5.2 ug/L	20.2 to 21.3 ug/L
Zinc	110 ug/L	110 ug/L	Not Provided	Not Applicable	67 ug/L	70.1 to 103 ug/L

1 ROD (1989), page 10-19, 10-20. For Arsenic, these are based on EPA and State identified water quality standards for water and fish ingestion (acute). For all other elements, these are based on EPA and State identified water quality standards for long-term protection of aquatic life (chronic).

2 ROD (1989) page 5-2

3 EPA National Recommended Water Quality Criteria. Values given for acute aquatic life (Arsenic), and continuous or long-term exposure (for all other parameters).

4 The MCL has recently been revised to 10 ug/L (effective 1/23/06).

5 Circular WQB-7, Montana Numeric Water Quality Standards, January 2004. Values given for acute aquatic life standards (Arsenic) and Chronic (for all other parameters). Per guidance in WQB-7, these values were not adjusted for hardness.

6 Source: 2005 Ecological Risk Assessment, EPA. Appendix A, Table 1a Measured Dissolved Surface Water Concentrations in Samples Collected During the 2003 Field Investigation.

### **Question C: Has other information come to light that could call into question the protectiveness of the remedy?**

There is no other information that calls into question the protectiveness of the remedy for OU1.

#### ***Technical Assessment Summary***

According to the data and documents reviewed, the remedy is largely functioning as intended by the ROD. All major physical and construction related remedy elements have been completed, except for remediation of the drying pad between Upper and Lower Lakes. However, the contaminant levels in Lower Lake have not met the standards prescribed in the ROD for Copper and Arsenic.

A general requirement of the OU1 remedial action was to eliminate future contact between process waters and the underlying soils and groundwater. This remedy did not include prescribed standards or points of compliance for groundwater, and was considered a 'first step' only to eliminating this known prominent source of groundwater contamination. Groundwater contamination associated with OU1 had been confined to the shallow aquifer, which is not a source of drinking water in East Helena. However, EPA's RCRA program recently found evidence of arsenic contamination in the intermediate zone of the aquifer underlying East Helena (ATSDR 2002). See Appendix A for a more detailed discussion of actions pertaining to the Groundwater OU2.

Surface water and sediments in Lower Lake may be acutely toxic to the aquatic community due to elevated concentrations of several metals including cadmium, antimony, thallium, and selenium. These concentrations are above levels associated with acute and chronic toxicity for several fish and benthic invertebrate species (EPA 2005).



## VIII. Issues

Item No.	Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1	The prescribed standards for surface water in Lower Lake have not been met.	Y	Y
2	As prescribed by a 1993 ESD, the drying area between Upper and Lower Lake has not yet been completely or adequately remediated.	Y	Y
3	A 1993 ESD stated that, "monitoring wells shall be installed downgradient from Lower Lake and between Lower Lake and Prickly Pear Creek prior to remediation of Lower Lake, but not later than July 1, 1993, to monitor for compliance with performance standards." Under the RCRA, some wells have been installed. However, no performance standards have been set for groundwater.	Y	Y

## IX. Recommendations and Follow-up Actions

Item No	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
1	The prescribed standards for surface water in Lower Lake have not been met.	Lower Lake water should be treated in the HDS facility until it reaches prescribed standards. If this approach is deemed invalid, an evaluation should be conducted to determine the most appropriate treatment method.	Asarco	2006

Item No	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
2	As prescribed by the ESD, the drying area between Upper and Lower Lakes has not yet been completely or adequately remediated.	The area between Upper and Lower Lake should be remediated. The ESD states, "the sediments under the pad (in the contaminated area between Upper and Lower Lake) shall be excavated and smelted after all Lower Lake sludges and sediments are excavated, dried, and removed from this area." However, because the plant is closed and smelting is no longer an option, the contaminated material should be disposed of under RCRA regulations.	Asarco	2007
3	A 1993 ESD stated that, "monitoring wells shall be installed downgradient from Lower lake and between Lower Lake and Prickly Pear Creek prior to remediation of Lower Lake, but not later than July 1, 1993, to monitor for compliance with performance standards." Under the RCRA , some wells have been installed. However, no performance standards have been set for groundwater.	Groundwater monitoring wells should be installed as prescribed by the ESD. Performance standards should be developed for groundwater related to OU1.	EPA	2006

## X. Protectiveness Statement(s)

The remedy as implemented is not yet fully protective of human health and the environment. Lower Lake contaminants exceed the standards prescribed by the ROD for two of five parameters, and Lower Lake is hydrologically connected to Prickly Pear Creek, a water of the U.S.

## XI. Next Review

The Site requires ongoing five-year reviews in accordance with CERCLA § 121 (c). The next five year review for the East Helena Site will be performed by January 2011, five years from the date of this review.